

Chapter 7: Mathematics of Selling

Success of a business depends on such factors as:

- Customer relations
- Quality of product and service
- Time to market and lead time
- Price

Price must be:

- Low enough to attract customers
- High enough to cover operating expenses and make a profit

cost = net cost
(from earlier)

7.1) Markup on Cost

1. Recognize the terms used in selling

Cost:

- Price paid to supplier (manufacturer or wholesaler) after trade discounts and cash discounts have been taken.
- Shipping and Insurance costs are included.

Selling Price:

- Price offered to customer

Markup, "Margin", or "Gross Profit":

Cost of Product + Markup = Selling price

Selling Price - Cost = Markup

Operating Expenses or "Overhead":

- Examples:
 - Wages
 - Rent
 - Utilities
 - Insurance
 - Advertising

Net Earnings:

Total sales (Total Revenue)
- Cost of Goods
- Operating Expenses
= Net Earnings or Net Profit

Markup is what you add to to cost to get selling price

Formula

Formula

Formula

Markup on Cost:

chapter 7.1

- Used by Manufacturers, wholesalers, and some retailers
- Cost is the base on which to compare everything!

Markup on selling price:

chapter 7.2

- Mostly used by Retailers
- Because most of their financial data are expressed as a percentage of sales
- ****Sell Price is the base on which to compare everything!**

Formulas are on next page →

2. Know the basic formula for markup

Cost + Markup = Selling price

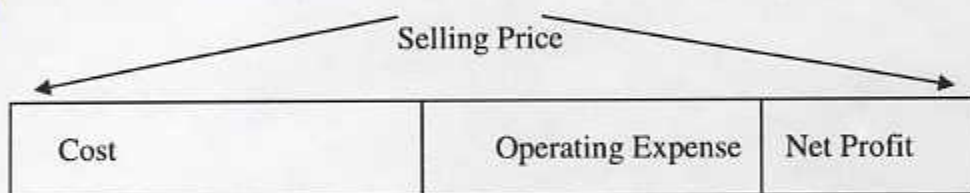
- This markup formula is used when markup is expressed as
 - A percentage of sales, or
 - A percentage of cost

Other ways to arrange the first equation:

1) Cost + Markup = Selling price

2) Selling Price - Markup = Cost

3) Selling Price - Cost = Markup



Example:

If cost is \$15 and selling price is \$20, what is the mark up?

$$\$20 - \$15 = \$5 = \text{Markup}$$

Example:

If markup is \$5 and selling price is \$20, what is the cost?

$$\$20 - \$5 = \$15 = \text{cost}$$

Example:

If the cost is \$15 and the mark up is \$5, what is the selling price?

$$\$15 + \$5 = \$20 = \text{selling price}$$

Cost always is base

MARKUP ON COST

This one formula will work for all Markup on cost prob.

$$\frac{\$10.00}{\$10.00} = 1 \text{ rate} \quad \boxed{100\%} \text{ cost} \quad \$10.00 \quad \text{base} \quad \$15.00 - \$5.00 = \$10.00$$

$$\frac{\$5.00}{\$10.00} = .5 \text{ rate} \quad 50\% + \text{Markup} \quad \$5.00 \quad \text{part} \quad \$15.00 - \$10.00 = 5.00$$

$$\frac{\$15.00}{\$10.00} = 1.5 \text{ rate} \quad 150\% = \text{Selling Price} \quad \$15.00 \quad \text{part} \quad \$10.00 + 5.00 = 15.00$$

* Manufacturers use Markup on cost to see what the "profit margin" is

Example $\frac{\$5.00}{\$10.00} = \frac{1}{2} = .5 \Rightarrow 50\%$ Markup on cost or "Gross Profit"

* For Markup on sell price sell price always is base

MARKUP ON SELLING PRICE

This one formula will work for all Markup on sell price

$$\frac{\$10.00}{\$15.00} = .66 \quad 66\frac{2}{3}\% \text{ rate} \quad \text{Cost} \quad \$10.00 \quad \text{part} \quad \$15.00 - 5.00 = 10.00$$

$$\frac{\$5.00}{\$15.00} = .33 \quad 33\frac{1}{3}\% \text{ rate} \quad + \text{Markup} \quad \$5.00 \quad \text{part} \quad \$15.00 - 10.00 = 5.00$$

$$\frac{\$15.00}{\$15.00} = 1 \quad \boxed{100\%} \text{ rate} = \text{selling Price} \quad \$15.00 \quad \text{base} \quad \$10.00 + \$5.00 = \$15.00$$

* Retail stores use Markup on selling price to see what part of every

dollar is gross profit and what part is cost

Example $\frac{5}{15} = .33 \Rightarrow 33\frac{1}{3}$ cents on every dollar is gross profit

$\frac{10}{15} = .66 \Rightarrow 66\frac{2}{3}$ cents on every dollar is cost

Example:

If cost of boomerang is \$20 and the selling price is \$30, find:

- Markup in dollars
- Percent of mark up based on cost
- Percent of sell price based on cost

Step 1: Set up formula

$$\begin{array}{r}
 100\% \\
 + \% \\
 \hline
 = \%
 \end{array}
 =
 \begin{array}{r}
 \text{cost} \\
 + \text{Markup} \\
 \hline
 = \text{sell price}
 \end{array}
 \begin{array}{r}
 \$20 \\
 \$ \\
 \$30
 \end{array}
 \begin{array}{r}
 \text{Base} \\
 + \text{Part} \\
 \hline
 = \text{other part}
 \end{array}$$

100%	Cost	\$20	Base
+%	+Markup	\$	+Part
=%	=Sell Price	\$30	=Part

**With just cost and sell price and the knowledge that cost = base = 100%, we can solve for all the rest!

Step 2: find mark up in dollars

$$\begin{array}{r}
 \text{sell price} \\
 \$30
 \end{array}
 -
 \begin{array}{r}
 \text{cost} \\
 \$20
 \end{array}
 =
 \begin{array}{r}
 \text{Markup} \\
 \$10
 \end{array}$$

$$\begin{array}{r}
 100\% \\
 + \% \\
 \hline
 = \%
 \end{array}
 =
 \begin{array}{r}
 \text{cost} \\
 + \text{Markup} \\
 \hline
 = \text{sell price}
 \end{array}
 \begin{array}{r}
 \$20 \\
 \$10 \\
 \$30
 \end{array}
 \begin{array}{r}
 \text{Base} \\
 + \text{Part} \\
 \hline
 = \text{part}
 \end{array}$$

Sell Price - Cost = Markup

\$30 - \$20 = \$10

100%	Cost	\$20	Base
+%	+Markup	\$10	+Part
=%	=Sell Price	\$30	=Part

Step 3: Find % of mark up based on cost

+ 100% + % 	cost \$20 + Markup \$10	base + Part
= %	= sell price \$30	= Part

$$\frac{P}{B} = R = \frac{\text{Markup}}{\text{cost}} = \frac{\$10}{\$20} = \frac{1}{2} = .5 \Rightarrow 50\%$$

Compare \$10 to \$20 – what percent of \$20 is \$10?

\$20 = cost = base
\$10 = mark up = part

(Markup on cost rate) →

100% + 50%	cost \$20 + Markup \$10	Base + Part
= % 	= sell price \$30	= Part

Formula for rate:

Rate = Part/Base

$$\$10/\$20 = \frac{1}{2} = .5 = 50\%$$

100%	Cost	\$20	Base
+50%	+Markup	\$10	+Part
= %	=Sell Price	\$30	=Part

Step 4: Find % of sell price based on cost

$$100\% + 50\% = 150\%$$

100%	Cost	\$20	Base
+ 50%	+ Markup	+ \$10	+ Part
= 150%	= sell price	= \$30	= Part

100%	Cost	\$20	Base
+50%	+Markup	\$10	+Part
=150%	=Sell Price	\$30	=Part

From our 2 numbers 20, 30 we solved for everything

- **You have solved for everything!
- Formula can be used to solve all these problems.

Example 3:

- Markup on a basketball is \$14.00
- Markup on cost is 50%
- Find the cost
- Find the Sell price

1st SET UP

	100%	C		Base
Rates	+ 50%	+ M	\$ 14	+ Part
	= %	= S		= Part

2nd solve & plug numbers in

$$\frac{P}{R} = B = \text{cost} = \frac{14}{.5} = \$28 \text{ cost}$$

$$C + M = S = 28 + 14 = \$42 \text{ sell price}$$

$\frac{\text{cost}}{\text{Rate}} + \frac{\text{Markup ON cost}}{\text{Rate}} = \frac{\text{sell price}}{\text{Rate}} = 100\% + 50\% = 150\%$

	100%	C	\$ 28	Base
	+ 50%	+ M	\$ 14	+ Part
	= 150%	= S	= \$ 42	= Part

100%	Cost	\$28	Base
+ 50%	+ Markup	\$14	+ Part
= 150%	= Sell Price	\$42	= Part

Example 4:

- Financial calculator cost is \$23.60
- The markup on cost is 25%
- Find the markup
- Find Selling price

(step 1)

	100%	C	\$ 23.60	Base
Rates	+ 25%	+ M	+ \$	+ Part
=	%	= S	= \$	= Part

(step 2)

$B * R = P = 23.60 * .25 = \$ 5.90 = \text{Markup}$

$C + M = S = 23.60 + 5.90 = \$ 29.50 = \text{sell Price}$

$C.R. + \frac{\text{Markup on Cost}}{\text{Rate}} = S.P.R. = 100\% + 25\% = 125\%$

	100%	C	\$ 23.60	Base
	+ 25%	+ M	+ \$ 5.90	+ Part
=	125%	= S	= \$ 29.50	= Part

100%	Cost	\$23.60	Base
+ 25%	+ Markup	\$5.90	+ Part
= 125%	= Sell Price	\$29.50	= Part

Example 5:

- Baseball glove selling price is \$42.00
- The sell price as a percent of cost is 140%
- What is the cost of the baseball glove?

step 1

100%	C	\$	Base
+ %	+ M	+ \$	+ Part
= 140%	= S	= \$ 42.00	= Part

step 2

$$\frac{P}{R} = B = \frac{42}{1.40} = \$30 = \text{Cost}$$

$$S - C = M = 42 - 30 = \$12 = \text{Markup}$$

$\left\{ \begin{array}{l} \text{Sell price} \\ \text{Rate} \end{array} \right\} - \left\{ \begin{array}{l} \text{Markup} \\ \text{ON} \\ \text{cost} \\ \text{Rate} \end{array} \right\} = \left\{ \begin{array}{l} \text{cost} \\ \text{Rate} \end{array} \right\} = 140\% - 100\% = 40\%$

100%	C	\$ 30.00	Base
+ 40%	+ M	+ \$ 12.00	+ Part
= 140%	= S	= \$ 42.00	= Part

100%	Cost	\$30	Base
+ 40%	+ Markup	\$12	+ Part
= 140%	= Sell Price	\$42	= Part

7.2) Markup on Selling Price

1. Understand the phrase "markup based on selling price"

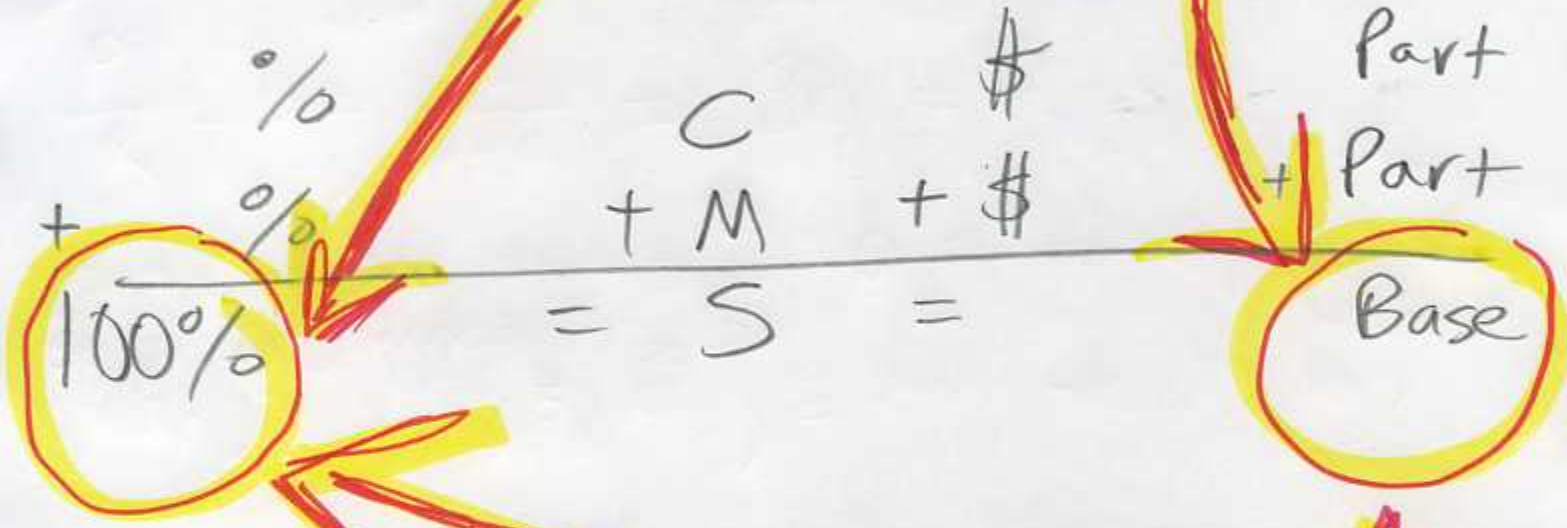
Markup on selling price:

- We are going to be talking about percentages
- Why percentages: because you can compare across businesses and industries
- Mostly used by Retailers – because most of their financial data are expressed as a percentage of sales
- Sell Price is the base on which to compare everything

2. Solve markup problems when selling price is the base

- Same formula as before except we change which number we call the base
- The number we compare everything to changes
- Sell Price is the base on which to compare everything

Base is sell price



Rate	%	Cost	\$	Part
Rate	+%	+Markup	\$	+Part
=100%		=Sell Price	\$	=Base

Markup based on Sell price
Sell Price Always base!!

*You can use this formula for most problems – solve for \$ amounts, solve for % amounts
** If you know what is the base, or "starting point" you can figure most things out from there.

Base is sell price

Example:

If the cost of boomerang is \$20 and the selling price is \$30, find:

- Markup in dollars
- Percent of mark up based on sell price
- Percent of cost based on sell price

Step 1: Set up formula

$$\begin{array}{r}
 + \frac{\%}{\%} \text{ (Markup on sell price Rate)} \\
 \hline
 100\%
 \end{array}
 + \frac{C}{M}
 = \frac{S}{\$30}
 = \frac{\$20}{\$10} + \text{Part}
 = \text{Base}$$

%	Cost	\$20	Part
+%	+Markup	\$	+Part
=100%	=Sell Price	\$30	=Base

**With just cost and sell price and the knowledge that sell price = base = 100%, we can solve for all the rest!

Step 2: find mark up in dollars

$$S - C = M = \$30 - \$20 = \$10 = \text{Markup}$$

Sell Price - Cost = Markup

$$\$30 - \$20 = \$10$$

%	Cost	\$20	Part
+%	+Markup	\$10	+Part
=100%	=Sell Price	\$30	=Base

Step 3: Find % of mark up based on sell price

Formula for rate: Rate = Part/Base

$$R = \frac{P}{B} = \frac{20}{30} = \frac{2}{3} = .\overline{33} = 33\frac{1}{3}\%$$

\$30 = sell price = base
 \$10 = mark up = part
 $\$10/\$30 = 1/3 = .333 = 33\frac{1}{3}\%$

	C	\$ 20	Part
	+ M	+ \$ 10	+ Part
	= S	= \$ 30	= Base

$$66\frac{2}{3}\% + 33\frac{1}{3}\% = 100\%$$

%	Cost	\$20	Part
+33 1/3%	+Markup	\$10	+Part
=100%	=Sell Price	\$30	=Base

Step 4: Find % of cost based on sell price

$$100\% - 33\frac{1}{3}\% = 66\frac{2}{3}\%$$

{ Markup on
sell price Rate }

{ cost as a percentage
of sell price }

Sell price % - Markup % = Cost %

$$100\% - 33\frac{1}{3}\% = 66\frac{2}{3}\%$$

OR

$$100\% - 33.33\% = 66.67\%$$

66 2/3%	Cost	\$20	Part
+33 1/3%	+Markup	\$10	+Part
=100%	=Sell Price	\$30	=Base

****You have solved for everything!**

Example of markups based on sell price from varying industries page ~~267~~ 271

3. Use the markup formula to solve variations of markup problems

Example 2:

- Three ring binder has a **markup of \$1.72**
- The \$1.72 is a markup on selling price equal to **35%**
- Find the cost of the binders
- Find the sell price for the binders

(step 1)

65% $+ 35\%$ <hr/> $= 100\%$	C $+ M$ <hr/> $= S$	$\$ 3.19$ $+ \$ 1.72$ <hr/> $= 4.91$	Part + Part <hr/> = Base
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$$B = \frac{P}{R} = \frac{\text{Markup}\$}{\text{Markup on sell price Rate}} = \frac{1.72}{.35} = 4.91428 \approx 4.91$$

Round to here (penny) \nearrow $\$ 4.91$ = sell Price

$$S - M = C = 4.91 - 1.72 = 3.19 = \text{cost}$$

$$\left\{ \begin{array}{l} \text{cost as a} \\ \text{\% of} \\ \text{sell price} \end{array} \right\} = 100\% - \left\{ \begin{array}{l} \text{Markup on} \\ \text{cost} \\ \text{Rate} \end{array} \right\} = 100\% - 35\% = 65\%$$

%	Cost	\$C	Part
+ %	+ Markup	+ \$1.72	+ Part
= 100%	= Sell Price	= \$S	= Base

Example 4:

- Cost of jogging shorts equal \$9.15
- The markup on sell price is 25%
- Find the markup

$$\begin{array}{rcl}
 \textcircled{75} \% & & \$9.15 \\
 + 25 \% & \text{markup on} & + \$27.45 \\
 & \text{sell price} & + \text{Part} \\
 & \text{rate} & \\
 \hline
 = 100 \% & & = \$36.60 = \text{Base}
 \end{array}$$

$$100 \% - \left\{ \begin{array}{l} \text{markup on} \\ \text{sell price} \\ \text{rate} \end{array} \right\} = \left\{ \begin{array}{l} \text{cost as a} \\ \text{percent of} \\ \text{sell price} \end{array} \right\} = 100 \% - 25 \% = \textcircled{75 \%}$$

$$B = \frac{P}{R} = \text{sell price} = \frac{\text{cost}}{\text{cost rate}} = \frac{9.15}{.75} = 36.60000 = \textcircled{36.60}$$

$$S - C = M = 36.60 - 9.15 = \textcircled{\$27.45}$$

$$\text{check} = \frac{27.45}{36.60} = .750000 \checkmark$$

%	Cost	\$9.15	Part
+ 25%	+ Markup	+ \$M	+ Part
= 100%	= Sell Price	= \$\$	= Base

4. Determine percent markup on cost and the equivalent percent markup on selling price

- Sometimes markup based on cost must be compared to markup based on sell price.

Example:

- A manufacturer must understand what they use:
 - mark up based on cost
- While at the same time they must understand what the retailers use:
 - markup based on sell price

next pages



